scopus maksimus

by Maksimus Bisa

Submission date: 05-Jan-2021 06:06PM (UTC+0700)
Submission ID: 1483242671
File name: f_Professional_Boxers_During_Covid-19_A_Literature_Study_1.docx (46.52K)
Word count: 5462
Character count: 31118

Autogenic and Audiovisual-Self Training for the Biomotor Abilities of Professional Boxers During Covid-19: A Literature Study

Maksimus Bisa[1*], James A.P Tangkudung[2], Junaidi[3], Firmansyah Dlis[4]
[1,2,3,4]Universitas Negeri Jakarta, Jakarta, Indonesia,
Email: maxi.lado@yahoo.com

Abstract

Background: Boxing is a popular contact sport that is in demand by many. Physical distancing and social distancing due to Covid-19 have caused various championships to be delayed due to environmental changes imposed by Covid-19. It causes the willingness and enthusiasm to practice the trainers to decrease. Physiologically, the strength and explosive power of the muscles will decrease, which is preceded by a decrease in the number of myofibrils, reduced muscle volume (disuse atrophy), then stiffness and limited motion of the joints occur. A person's motor abilities will decrease after 5-7 days if they do not do the exercises as usual. Maximum strength, explosive muscle power and mental training must be appropriately trained and prepared. **Methods:** Qualitative descriptions with literature studies which analyze various theories put forward by experts on strength, maximum strength, explosive muscle power, and anxiety which can affect the peak performance of professional boxers in achieving maximum performance. **Result:** The conditions of environmental change due to the Covid-19 pandemic have forced the development of training methods and techniques through studies based on sports science and sports technology that are innovative, adaptive and realistic. **Conclusion:** Professional boxers must maintain their motor skills and cope with stress through audiovisual training (audiovisual self-training) and autogenic training regularly and programmed. Maintaining and increasing muscle strength, muscle explosiveness, and maintaining an ideal body weight according to class in boxing are essential things besides other internal and external factors.

Keywords: *disused atrophy, maximum strength, audiovisual self-training, autogenic training*.

INTRODUCTION

Technological innovations are increasingly influencing the sports industry for global competitiveness, various contexts including gaming experiences, consumers and spectators. Technology in the field of sports is becoming more critical in understanding how to develop a detailed plan for handling innovation, especially in response to the changing environmental constraints introduced by Covid-19 to provide adequate services through a more realistic approach (Ratten, 2020: 1). Vanessa Ratten made three significant contributions to technological innovation and the sports management literature namely 1) Expanding and integrating different research topics to provide a more comprehensive perspective; 2) Step from a rigid view of the sport technology phase for a more complex and versatile approach; 3) Shift the subject of literature outside the company to incorporate other layers of study, such as athlete, culture, and society.

The ability to choose stimuli and understand the reactions of the environment and other people is essential in several aspects of life, and in sports, It has a major function, for example, in winning games. These capacities underlie perception-cognitive skills that span a variety of cognitive tasks, such as focus, sensory discrimination, anticipation, problem-solving, and decision-making. To do this, athletes must concentrate, assess and appreciate implicit kinematic indices long before any action is taken. Combat sports, such as boxing, are not exempt from this claim. As an open skill sport, it is characterized as an interceptive sport

in which athletes must organize and communicate with external opponents with or without artifacts. This sport is marked by rapid shifts in the atmosphere in which any athlete must react to new conditions at all times (Russo & Ottoboni 2019: 60).

Maximum mass, such as muscular or explosive force (mixed power and endurance), stamina (musculoskeletal and cardiorespiratory resistance, both anaerobic and aerobic), speed (including speed endurance and maximum speed including agility), coordination (perfect coordination) and versatility (full range of motion) are the core aspects of physical performance that the athlete must pay attention to (Bompa & Buzzichelli, 2019: 7). Thus strength, endurance, and speed are abilities that athletes must have in order to be successful in performance (Bompa & Haff, 2009: 259).

Russo and Ottoboni (2019: 60) have indicated that, in addition to power, stamina and pace, the ability to process is very critical in making the right decisions to win the match. For the past 40 years, scientists have thoroughly researched whether fitness preparation can enhance cognitive-perceptive abilities, both in particular activities and in genetics, with strong examples of how capacity influences brain activity. Thus, experience can affect the unique and general cognitive ability of athletes.

Professional boxers need motor abilities consisting of strength, maximum strength, and explosive muscle power to reach peak performance in order to win the competition. The desire to strike the opponent is a major element in boxing. Straight, upper and hook are punches that are very dangerous to the enemy when performed in a technique with the right muscle destructive force by practicing maximum control (Bisa, 2020: 721). Mike Tyson, a world heavyweight boxer, is greatly feared for his deadly hook. A boxer wants the strength of the straight blows, the upper cut and the hook to bring down his opponent. It is also important to carry out an examination of physical ability, mental preparation, mastery of strategies and methods used in teaching and competition in the training program, in addition to other supporting variables such as the environment, facilities, financing and guidance systems.

The age-related evolution of the human race suggests that various biological capacities typically peak at different points of an individual's life. Exercise physiology literature indicates that optimum physiological activity happens only before the age of 30. The process of degeneration is a normal process that happens in any organism, marked by the loss of the capacity of cells and tissues to restore and replace themselves and to preserve their typical structure and function. Anatomical changes can occur in the body's organs over time during the aging/degeneration period (Amarya & Sabharwal, 2018).

Awareness of peak success age in elite sports will provide trainers and scientists with useful knowledge to build long-term fitness programs and help them assess the success of athletes towards their performance goals. Such knowledge can also be useful for athletes choosing decision-makers for major events and for national athletic associations responsible for the distribution of funds and services on the basis of the athlete's probability of success for the potential medal winner (Allen and Hopkins, 2015: 2).

Not only physical, technical, and tactical aspects that support athletes' achievement, but also psychological aspects. It cannot be underestimated because they play a significant role in sports performance, therefore psychological/mental training (mental training / autogenic training) at the stage of general preparation, preparation specifically, pre-competition and major competitions should be awarded to athletes.

METHOD

The approach shown in the time of publication is a qualitative description of the literature review that analyzes various hypotheses and research results put forward by experts regarding the factors of strength, maximum strength, explosive muscle power, and anxiety that affect

the peak performance of professional boxers during the Covid-19 pandemic to achieve maximum performance supported by empirical facts in the field.

DISCUSSION

Professional boxers are boxers who fight for a certain amount of pay. A professional boxing match is a match that pays a particular nominal value. Boxers' fees vary widely, depending on the level and popularity of the boxer. It is not sure that a boxer who becomes a world champion gets a higher salary than a boxer who is not a world champion. The Filipino boxer, Manny Pacquiao, in some of his matches, is not world champion and does not fight for the world title, but the pay is many times higher than that of Indonesian boxer Chris John who is world champion. It is because Pacquiao's popularity is way above Chris John's. McCrory et al. in Bisa (2020: 727) suggest that amateur boxing is different from professional boxing for a variety of reasons, including competition incentive, different rules and facilities, but more notably there is greater risk to injuries in professional boxers (longer fights, more boxing practice, smaller and lighter boxing gloves, a more significant score reward for a shot that injures an opponent, a longer career after an amateur career). A knockout is an unusual occurrence in boxing, for instance, the 2001 World Amateur Title was just six knockouts out of a total of 366 fights. Furthermore, some tests suggest that a single blow by a professional heavyweight boxing champion will produce up to 6.320 N impact powers (0.63 tonnes). In contrast, an equal strike will be delivered by a wooden hammer with a weight of 6 kg (13 lbs) if swung to the target.

A qualified physical condition is an essential requirement for increasing an athlete's performance. One of the essential physical components to support the other components is muscle strength.

Bompa and Buzzichelli (2019: 233, 261) note that force is defined as the capacity of the neuromuscular resources to achieve strength against external load. The maximal strength that an athlete can show depends on seven key principles, including the number of motor units recruited, the speed of motor unit coding, motor unit coordination, stretch-shortening cycle, the degree of neuromuscular inhibition, the form of muscle fiber, the degree of muscle hypertrophy. Harsono (2017: 47) states that strength is energy to fight a resistance or the ability to generate tension. Thus strength is an ability that is closely related to the process of muscle contraction.

Muscle is an active means of movement; it performs movements independently and moves the organs where it is located. Skeletal muscles are the most massive muscles in our body, moving the skeleton so that our body can move. Five physiological characteristics support Muscle function, they are: 1) Contractability - being able to shorten from its standard size; 2) Extensibility - being able to extend from its standard size; 3) Elasticity - being able to return to its initial state after shortening or extending; 4) Conductivity - properties able to conduct electric current (impulse), and 5) Plasticity - the ability to return to its original shape after the external force exerted is lost, for example when a muscle is pressed flat, after releasing it returns to its original shape immediately. The ability of muscles like this cannot be separated from their adequate structural support. Skeletal muscles have a fibrous structure resembling a network of electric cables. The most extensive form is known as muscle or flesh. The mass is a collection of muscle bundles, and the muscle bundles are an arrangement of a single thick muscle fibre. The single muscle fibre is composed of many myofibrils; inside myofibrils, there is a functional muscle unit called sarcomere (Wahid, 2018).

Muscle contraction occurs because there is a stimulus both from within and from outside. The stimuli are transmitted via nerve cells to the control centre in the brain or spinal

cord. If the stimulus creates an action potential, then the muscular (muscle) response can occur in the form of muscle contraction.

Kisner and Colby (2012: 158) note that muscle strength is a general concept that refers to the capacity of the contractile tissue to generate tension and strength on the basis of muscle stress. More specifically, muscle strength is the most important measurable force that a muscle or muscle group can produce to overcome resistance or resistance. Thus, muscle strength is the ability of muscles to bear the full load.

Bompa and Buzzichelli (2015:25) show that overall power is essentially the maximum power that must be created by the neuromuscular system during expansion. Physiologically, the strength of the muscle is directly proportional to the thickness/size of the muscle, which means that the greater the volume of the muscle, the more muscular the contraction resulting from the movement. The subsequent gestures are the result of the activation of the motor units within the muscles. The motor cell is a single motor neuron with all the muscle fibers it supplies.

The number of muscle fibers per motor unit and the number of motor units per muscle are distinct (Guyton & Hall, 2007). Magill and Anderson (2017: 80) state that one motor unit can innervate 700 muscle fibres. 1500-2000 muscle fibres produce coarse and robust movements. Thus, the more motor units recruited, the more muscular the muscle contraction such that the resultant movement becomes more muscular (Kisner & Colby, 2012: 159).

Bompa and Haff (2009: 263-265; Bompa and Buzzichelli, 2019: 233-235) state that the maximum muscle strength is influenced by seven factors, namely: 1) Motor unit recruitment - Recruitment typically happens in a standard pattern from smaller to larger engine units. The Henneman theory of calculation, which shows that the scale of the engine unit determines the activation. Big engine units have a higher activation threshold and are activated after smaller engine units. The larger motor unit is triggered in response to higher external loads. However, the pattern of recruitment of the motor unit is influenced not only by the force applied but also by the tempo of contraction, the form of contraction and the metabolic state of the muscles; 2) Motor system frequency coding - The coding value is related to the burning frequency of the engine unit. One of the special features of speed coding is that the force produced by the muscle increases without the recruitment of additional motor units. Van Cutsem and colleagues proposed that the rate of coding played a crucial role in assessing the rate of voluntary contraction. Several investigations find that a higher rate of combustion of the engine unit is correlated with a higher rate of power production. Explosive high-power performance movements (e.g. plyometrics, weightlifting, squatting) have the ability to improve the engine unit rate of encoding and they aim to increase the engine unit burn rate; 3) Motor unit synchronization - The synchronization of motor units happens as a function of the synchronized stimulation of several motor units and has traditionally been proposed to achieve improved power production. The coordination of the motor unit performs a role in the production of power during the rapid contraction of the muscle because the synchronization of the motor unit can have the most important effect on the success of tasks involving the synchronized stimulation of many muscles at the same time, such as running, where during the propulsion (push-off) phase the gastrocnemius muscle, soleus, glutei, hamstrings and quadriceps all participated; 4) Stretch shortening cycle – Stretch shortening cycle (SSC) is characterized as a combination of excentric and concentric muscle contractions. The stretch-shortening interval can be assumed to be a plyometric muscle movement, since the eccentric muscle action (muscle lengthening) happens prior to the concentric muscle action (muscle shortening). The best known result of the stretch-shortening cycle is improved efficiency (concentric muscle action) during the final step of the cycle. The efficiency improvement resulting from the stretch-shortening period is most likely due to the conservation of elastic energy during the eccentric process, the activation of the stretch

reflex, and the optimization of muscle activation. Several studies have suggested that resistance training improves the maximum strength as a result of improved capacity to enable a stretch-shortening cycle; 5) Neuromuscular inhibition-Neuromuscular inhibition may occur as a result of nerve input from multiple muscle and joint receptors that may reduce the production of force. For eg, the Golgi tendon organ (GTO), which acts as a defensive system, avoids the build-up of harmful muscle forces at maximum or near maximum effort. If the sequence of neuronal stimulation of these defense mechanisms is changed, inhibition may occur and the power-generating potential may be increased. Evidence for this claim can be found in the work of Aagaard and colleagues, in which 14 weeks of heavy-duty training dramatically decreased neuromuscular inhibitory reaction; 6Muscle fiber form-Cross-sectional tests indicate that strength and power athletes have a high proportion of muscle fiber type II (fast-twitch) (53 percent to 60 percent). It is important because the muscle fiber characteristics of the athlete play a vital role in the ability of the athlete to demonstrate the optimum strength and power generating capability. Athletes who compete in endurance sports typically have a higher proportion of type I (slow twitch) muscle fiber due to higher levels of maximum oxygen intake and lower maximum strength generation. As a result, athletes who have a higher muscle fiber type II will pick up; 7) Degree of muscle hypertrophy-Increased muscle cross-sectional area leads to increased muscle hypertrophy in response to strength training. Growing the cross-sectional muscle area increases the number of contractile units, increasing the power generating capacity. Form II muscle fibers show greater plasticity, suggesting a higher rate of hypertrophy.

Bompa and Haff (2009: 268), divide strength as follows: 1) General strength is the strength of the overall muscle system; 2) Specific strength, defined as the strength that exists in certain muscles that are involved explicitly in specific movements or branches (considered as the prime mover); 3) The speed-strength (speed-strength/explosive power) is the product of the combination of two capacities, namely power and speed; 4) Maximum strength is the strength or the maximum force that can be shown by the neuromuscular system at the maximum contraction performed consciously; 5) muscular endurance, defined as the ability of the muscles to perform relatively strenuous activities over a long period; 6) Absolute strength, defined as the ability of an athlete to exert maximum power without considering his weight of the body; 7) Relative strength is the relationship between total strength and body weight.

Factors that can affect muscle strength include: a) Intermuscular coordination - It is the interaction performed by several muscle groups during activities, especially physical activities that require strength; b) Intramuscular coordination - Strength can also be affected by intramuscular coordination, or in other words depending on the function of the nerves of the muscles involved in carrying out the task of physical activity; c) Reaction of muscles to nerve stimulation - The muscle will react to nerve stimulation by 30% of the total potential possessed by the muscle concerned; d) Joint angle - Maximum strength will be achieved if the joint is physiologically involved in the outer range position (straight position or near straight position) and mechanically in the middle range position (90-degree position).

Bompa (1999: 1) states that five main theories are affecting strengthening exercises, namely 1) bodybuilding - exercis related to increasing muscle size, carried out six to 12 repetitions until fatigue arises; 2) High-Intensity Training (HIT)-requires high training loads during the year, conditioning can be attained in 20 to 30 minutes and is immune to high duration, long-lasting and consistent strength training; 3) Olympic weight lifting - significant effect at the beginning of strength training; 4) power training throughout the year, some coaches suggest that strength conditioning can take place from the first day of training to the major championship.; and 5) Power periodization-Sport strength training should be based on the particular anatomical criteria of the sport which should aid in the production of strength

and muscle endurance. Thus, high resistance to low repetition is the key feature of conditioning exercises.

Physiological adaptations in the strength training regimen can be classified as either physiological or morphological. Neurological adaptations consist of improvements in engine unit recruiting habits, engine unit alignment, engine unit burn rate, and reflex activation. Physiological variations to the strength training regimen may be categorized as either physiological or morphological. Neurological modifications consist of changes in recruitment patterns of the engine unit, synchronization of the engine unit, burn rate of the engine unit, and reflex activation `(Bompa & Buzzichelli, 2019: 235).

Research Ruddock et al., (2016: 81) with the title fitness and conditioning for Professional Boxing: Guidelines for Physical Training. This study aims to review the physiology of strength and condition of professional boxers as a trainer's basic knowledge, including preparation. The results showed that the adaptation of physiological characteristics is needed by a professional boxer to be successful in performance. Strength and specific training are done between 8-12 weeks before competing. Medical aspects and potential health risks must be considered when training and competing. Developing hand speed by favorable modifications to the series-elastic aspect and the neuromuscular system is a vital variable in the strength training recipe for professional boxers. There is no comprehensive research source in the implementation of sports science to prepare professional boxers. To date, there are no systematic scientific reports or realistic guidelines for the preparation of experienced boxers for training and competition.

Research by Neha, Ajita, and Rajdeep Kaur (2010: 1) entitled, Comparison of chosen physiological variables between various weight-category Indian elite male boxers. The purpose of this research was to compare the chosen physiological parameters between the different weight categories of boxers (light, moderate and heavyweight). The results showed that there was a significant difference in the anaerobic ability index between light and heavy boxer categories. For that, we need to increase the anaerobic strength of boxers in the heavyweight category.

Bompa and Buzzichelli (2015: 25) note that power is the potential to execute destructive motions in the shortest possible time, which is the product of the combination of full strength and speed. The strength of the muscles of the arm is also the ability of the body to allow the muscles of the arms to function exclusively. Boxers in making strong movements or punches need the right muscle explosive power. Muscle destructive strength is the ability of the muscles to use the full energy applied in the shortest time possible. Kisner and Colby, too (2012: 159) state that the explosive capability of a muscle is a mixture of power and velocity, where power is the pressure or tension that can be produced by a muscle in a contraction with the maximum load, while velocity is the potential to travel in succession in the shortest time possible.

Two key factors can influence the explosiveness of the muscles, namely the intramuscular region, muscle structure, available energy, muscle fiber type. Neural factors, on the other hand, consist of elevated agonist activity, neural contribution as a benchmark for strength production, premovement silence, mobilization of motor units, selective stimulation of agonist muscles in a group muscle, as well as synchronization of action patterns and abilities.

Boxing sports involve many muscles, both as an agonist, antagonist, synergist, and fixator group in performing movements during training and competition. These muscles contract both concentrically and eccentrically in producing blows aimed at the opponent. In addition to the role of these muscles, studies of biomechanics including the angle of strike, angle of muscle pull, and distance/range of strokes are also very much needed in producing a strong and on target shot to bring down the opponent (Dlis, 2020: 77).

The boxer must pay attention to the angle of pull of the mobilizing muscles of the arm, in particular the triceps brachii, biceps brachii, supraspinatus, deltoideus and pectoralis major muscles, when contracting excentrically or concentrically (Bisa, 2020: 724). In addition, considerations that are no less significant are the activation of the stabilizer muscles for proximal joint stability and the magnitude of the muscle tension angle during stroke. The stress muscle angle is the angle created by the muscle pull line and its longitudinal axis (Kisner & Colby, 2012). Mechanically the muscle strength/pull is more significant at an angle of 90 degrees in a lever system (middle range), whereas physiologically the muscle strength is most significant in the elongated position (outer range). Muscle strength is diminished if the muscle tension angle is less than 90 degrees, so if the muscle tension angle is higher than 90 degrees, the joint will become unstable. Likewise, when making a stroke, the strike angle must combine the footsteps with the trunk rotation. Straight, upper and hook strokes are designed to knock down the opponent when performed with maximum intensity and right muscle strength and proper training, like a punch angle.. The power of the muscles of the arms and upper and lower limbs must also be adequately trained, as it has been found to be the secret to performance (Nikolaidis, Clemente, Busko, and Knechtle, 2017: 5).

Biomechanical features and motion examination in a boxer are inseparable as a fulcrum from the joint (fulcrum), Muscle as a driving force (stress), Bone as a moving or structure tissue, capsuleligamenter as a part that protects and stagnates the joints and other muscle tissues across the joints, such as nerves, arteries, bursa and skin. A good movement pattern in the shape of the angle of impact and the distance of the blow demands good joint flexibility and mobility, as well as being accompanied by an accurate and efficient muscle tension angle to deliver a well-targeted and resilient shot.

Centered on any of the above definitions and explanations, muscle strength is the ability of the neuromuscular system to produce strength against external resistance, taking into account the number of motor units enabled, the angle of muscle strain and the stability of the joint. Likewise, maximum strength is the maximum strength that the neuromuscular system can display during a maximum conscious contraction. In the meanwhile, explosive muscle strength is the overall capacity of the muscles to execute activities/movements with the maximum load in a give unit of time (integration of strength and speed). As a result, the greater the number of motor units that are triggered, the greater the force of muscle contraction produced.

Anxiety can occur at any time; one of the reasons is intense and persistent anxiety. There are two types of anxiety symptoms, namely somatic, which is characterized by anxiety, difficulty concentrating, complaining quickly, while cognitive is characterized by trembling, excessive sweating, rapid breathing, increased pulse inappropriately, feeling nauseous, and diarrhoea (Bebetsos, 2013: 2). As a result of this psychosomatic condition, a boxer will undergo tension (overtraining) that is characterized by elevated heart rate, increased breathing and body temperature, lowered body weight, vomiting, increased digestive enzymes, fatigue, behavioral changes and diminished excitement such that, eventually, they do not focus on training or competition (Bisa, 2020: 728).

Research by Munshi et al., (2020: 3) with the title, Repeated Stress Induces a Pro-inflammatory State, Increases Amygdala Neuronal and Microglial Activation, and Causes Anxiety in Adult Male Rats. The objectives of this research was to determine the effect of chronic stress on circulating immune parameters using repeated social defeat stress (RSDS) models of adult male rats. This research used RSDS to investigate how chronic social stress influences peripheral immune balance by evaluating peripheral immune precursor and mature T cells and different serum cytokinesThe findings revealed that stress could recruit the immune system to change the role of brain regions that are essential to emotion. This

modifications illustrate the comorbidity of multiple inflammatory diseases linked with chronic stress and psychological symptoms caused by chronic stress.

Anxiety and stress are emotions that everyone experiences. One of the psychological conditions that arises in athletes is fear or anxiety. Anxiety disorder is a severe form of mental disorder that causes significant problems and has a disabling effect (Kleinman, 2012). Significant activities before, after and at the conclusion of a sports match are heavily affected by the level of anxiety of athletic players, whether players, coaches, referees or fans. Psychological disorders in the form of anxiety and stress are often experienced by a boxer before, during and after a match. Shadows cause feelings of anxiety before the match, and during the match, this happens because of psychological pressures (Tangkudung, 2018; 376).

Research by Tazegul et al., (2015: 22, 25) with the title, Comparison of Continuous Anxiety Level of Some Individual Fight Athletes. The purpose of this research is to evaluate and compare the level of anxiety sustained by athletes involved with boxing, weightlifting, kickboxing and wrestling. The results showed that many factors negatively affected the athlete's performance. One of them is high anxiety. Therefore, psychological support and mental training should be provided to athletes, especially athletes with high levels of anxiety.

Boxers often experience anxiety due to various factors, including irregular training programs and the absence of matches as a result of the Covid-19 pandemic, which requires physical distancing and social distancing. It forces a change in the environment and training patterns that must be adhered to, both boxers, coaches, managers, boxing organizations and boxing lovers' societies. This condition, there will be a decrease in motor abilities (biomotor abilities), especially strength, maximum strength, and muscle explosive power.

There are many ways to conquer fear, including by calming by resting and listening to music, visualizing (watching the best videos) and inspiring yourself (self-talk) through stimulating the amygdala in a positive and persistent manner (Tangkudung, 2018: 384).

CONCLUSION

From the hypotheses, empirical findings and discussions that have been put forward, it can be inferred that during the Covid-19 pandemic, physical exercise independently must be carried out according to the training program agreed upon between the boxer and the coach even though there is no match schedule. It aims to maintain the physiological properties of muscles and joints, maintain and increase muscle strength and motor abilities. This independent physical exercise can be carried out in a gym, in the wild (on the beach, in mountainous areas) or with audiovisual assistance while still applying health protocols related to Covid-19. During the Covid-19 pandemic, excessive anxiety and stress should be avoided because it can reduce the body's immune system; therefore, mental training called mental/autogenic training is needed. Thus the role of coaches, management, and organizations is vital to support the existence of a professional boxer during the absence of a match during the Covid-19 period, in order to remain excellent in maintaining peak performance to achieve maximum performance as long as the boxer is in the golden age or period, namely between 16-30 years.

REFERENCES

1. Ratten, V. (2020). Sport technology: A commentary. *Journal of High Technology Management Research*. https://doi.org/10.1016/j.hitech.2020.100383. P.1.
2. Russo, G., & Ottoboni, G. (2019). The perceptual – Cognitive skills of combat sports athletes: A systematic review. *Psychology of Sport and Exercise*, *44*(April), 60–78. https://doi.org/10.1016/j.psychsport.2019.05.004. P. 60.

3. Bompa, T. O., & Carlo A. Buzzichelli. (2019). Periodization Theory and Methodology of Training. In *Human Kinetics*. https://doi.org/10.1017/CBO9781107415324.004. P. 7, 233-235, 261.
4. Bompa, T. O., & Haff, G. G. (2009). Periodization: Theory and Methodology of Training. *Champaign, Ill. : Human Kinetics*.P. 259, 263-265, 268.
5. Bisa, Maksimus. (2020). *Original Article Bio Motoric Analysis, Degeneration Process and Anxiety of Professional Boxer for Maximum Peak Performance : A Literature Study*. *6*(June), 720–731. https://doi.org/10.36678/ijmaes.2020.v06i02.001. P. 721, 723, 724, 727.
6. Amarya S, Sigh K., Sabharwal M. (2018). Ageing Process and Physiological Changes. in a book: Gerontology; 1st Ed. IntechOpen.
7. Allen, S. V., & Hopkins, W. G. (2015). Age of Peak Competitive Performance of Elite Athletes: A Systematic Review. In *Sports Medicine*. https://doi.org/10.1007/s40279-015-0354-3. P. 2.
8. McCrory, P., Falvey, É., & Turner, A. (2012). Returning to the golden age of boxing. In *British Journal of Sports Medicine*. https://doi.org/10.1136/bjsports-2012-091276. P. 459-460.
9. Harsono. (2017). Periodesasi Program Pelatihan. 2nd Ed; p 130. Bandung: Remaja Rosdakarya. P. 47.
10. Wahid, Muhammad Zainul at Sabtu, Oktober 27, 2018 http://biofunlearning.blogspot.com/2014/07/mekanisme-kontraksi-otot.html).
11. Kisner, C., and Colby, L. A. (2012). Therapeutic exercise: Foundations and techniques. 6th Edition. In *F. A. Davis Company*. https://doi.org/10.1123/att.7.2.40. P. 158, 159.
12. Bompa Tudor and Buzzichelli Carlo. 2015. *Periodization Training for Sports*. Third Edition. United States of America: Human Kinetics. P. 25.
13. Guyton A.C and Hall J.E. (2007). *Fisiologi Kedokteran*. 11th Ed. Jakarta: Penerbit Buku Kedokteran EGC.
14. Magill, R. A., & Anderson, D. I. (2017). *Motor Learning and Control: Concepts and Applications, Eleventh Edition*. United States of America: McGraw-Hill. P. 80.
15. Bompa, Tudor O. (1999). *Periodization Training for Sports*. *Program for Peak Strength in 35 Sports*. United States: Human Kinetics. P.1.
16. Ruddock, A. D., Wilson, D. C., Thompson, S. W., Hembrough, D., & Winter, E. M. (2016). Strength and Conditioning for Professional Boxing: Recommendations for Physical Preparation. *Strength and Conditioning Journal*. https://doi.org/10.1519/SSC.0000000000000217. P. 81.
17. Neha, Ajita, & Kaur, R. (2010). Comparison of selected physiological variables among different weight-category Indian elite male boxers. *British Journal of Sports Medicine*, *44*(Suppl_1), i25–i25. https://doi.org/10.1136/bjsm.2010.078725.83.
18. Dlis, Firmansyah. (2020). *Motor Learning dalam Olahraga Tinju (Bunga Rampai)*. Palembang: VC. Nakomu. P.77.
19. Nikolaidis, P. T., Clemente, F. M., Busko, K., & Knechtle, B. (2017). Physiological responses to simulated boxing: The effect of sitting versus standing body position during breaks: A pilot study. *Asian Journal of Sports Medicine*. https://doi.org/10.5812/asjsm.55434. P. 5.
20. Bebetsos, E.(2013). Do Anxiety, Anger And Aggression Differentiate Elite Water-Polo Players?. Journal of Physical Education And Sport (JPES), 13(2).
21. Munshi, S., Loh, M. K., Ferrara, N., DeJoseph, M. R., Ritger, A., Padival, M., Record, M. J., Urban, J. H., & Rosenkranz, J. A. (2020). Repeated stress induces a pro-inflammatory state, increases amygdala neuronal and microglial activation, and causes anxiety in adult male rats. *Brain, Behavior, and Immunity*. https://doi.org/10.1016/j.bbi.2019.11.023

22. Kleinman Paul. 2012. Psychology Facts, Basics, Statistics, Tests, and More. A Crash Course in the Science of the Mind. New York: Adams Media
23. Tangkudung A.,P.,J. (2018). *Sport Psychometrics*. *Dasar-dasar dan Instrumen Sport Psikometri*.: 1st ed. Jakarta : Raja Grafindo Persada. P. 376-384.
24. Tazegül, Ü., Küçük, V., Tuna, G., & Akgül, H. (2015). Continuous Anxiety Level of Some Individual Fight Athletes. *American Journal of Applied Psychology*. https://doi.org/10.12691/ajap-3-1-5. P. 22, 25.

scopus maksimus

ORIGINALITY REPORT

17%	13%	8%	12%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	ijmaes.org Internet Source	4%
2	Submitted to KPJ International College of Nursing and Health Science Student Paper	2%
3	pergamos.lib.uoa.gr Internet Source	1%
4	Soumyabrata Munshi, Maxine K. Loh, Nicole Ferrara, M. Regina DeJoseph et al. "Repeated stress induces a pro-inflammatory state, increases amygdala neuronal and microglial activation, and causes anxiety in adult male rats", Brain, Behavior, and Immunity, 2020 Publication	1%
5	Gabriele Russo, Giovanni Ottoboni. "The perceptual – Cognitive skills of combat sports athletes: A systematic review", Psychology of Sport and Exercise, 2019 Publication	1%
	Submitted to Curtin University of Technology	

6	Student Paper	1%
7	www.sciepub.com Internet Source	1%
8	apcz.umk.pl Internet Source	<1%
9	McCrory, P., E. Falvey, and M. Turner. "Returning to the golden age of boxing", British Journal of Sports Medicine, 2012. Publication	<1%
10	link.springer.com Internet Source	<1%
11	Submitted to Nottingham Trent University Student Paper	<1%
12	bjsm.bmj.com Internet Source	<1%
13	eprints.whiterose.ac.uk Internet Source	<1%
14	Submitted to Study Group Australia Student Paper	<1%
15	repository.uki.ac.id Internet Source	<1%
16	nyaspubs.onlinelibrary.wiley.com Internet Source	<1%

17	Submitted to St. Mary's College Twickenham Student Paper	<1%
18	journal-ms.net Internet Source	<1%
19	www.theseus.fi Internet Source	<1%
20	Yuan-Yuan Han, Kai Jin, Qi-Sheng Pan, Bo Li, Zhuo-Qing Wu, Lin Gan, Li Yang, Cheng Long. "Microglial activation in the dorsal striatum participates in anxiety-like behavior in Cyld knockout mice", Brain, Behavior, and Immunity, 2020 Publication	<1%
21	www.springerprofessional.de Internet Source	<1%
22	Submitted to University of Wales Institute, Cardiff Student Paper	<1%
23	ladyirwin.edu.in Internet Source	<1%
24	www.rehabpub.com Internet Source	<1%
25	coachr.org Internet Source	<1%
	Submitted to Swinburne University of	

26	Technology Student Paper	<1%
27	www.coursehero.com Internet Source	<1%
28	quizlet.com Internet Source	<1%
29	Vanessa Ratten. "Sport technology: A commentary", The Journal of High Technology Management Research, 2020 Publication	<1%
30	jurnal.umt.ac.id Internet Source	<1%
31	Hill, Richard W.. "Animal Physiology", Oxford University Press Publication	<1%

Exclude quotes	On	Exclude matches	Off
Exclude bibliography	Off		